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EXAMINER

LAZORCIK, JASON L

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/824,836	Applicant(s) NGUYEN ET AL.	
	Examiner Jason L. Lazorcik	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 18 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Newly submitted claims 18 and 19 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-17, drawn to a process for making chalcogenide glass, classified in class 65
- II. Claims 18 and 19, drawn to a chalcogenide glass are classified in class 423.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the glass could be made by a materially different process such as by CVD.

Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 18 and 19 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 5 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicants specification as originally filed provides support for the claim limitation wherein the distilling step is carried out at a temperature below "about 550°C", however it is not evident that the specification supports the instant limitation requiring that said distillation be carried out at a temperature which is below precisely 550°C. Stated alternately, it is not evident that one of ordinary skill in the art would necessarily be apprised of the precise upper temperature limit, namely exactly 550°C, which Applicant currently claims for the distillation process.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Upton (US 3,209,641 and US 2,804,378) in view of (Churbanov et. al. (Journal of Optoelectronics and Advanced materials vol. 3, No. 2, June 2001, p. 341 – 349).

As set forth in the previous rejection dated January 18, 2007, Upton '641 teaches the synthesis of a highly IR transmissive chalcogenide glass by reacting an arsenic sulphide glass cullet with raw sulfur followed by distillation and homogenization of the molten distillate. To this end and with particular respect to Applicants independent claim 1, the reference teaches (see [Column 5, Line 68 to Column 6, Line 5], [Column 5, Line 68 to Column 6, Line 5], [Column 6, Lines 70-71], and [Column 6, Lines 43-48]);

1. Disposing an arsenic chalcogenide cullet and sulfur into an “open distillation system”
2. Distilling the arsenic chalcogenide cullet and sulfur in the open distillation to deposit said in a cold section of the distillation system, and
3. Sealing and subsequently heating the condensing chamber of the distillation system to homogenize/crystallize the distillate.

Upton discloses that at the hot and cold sections of the apparatus comprise glass (Column 2, lines 23-31) [**Claim 10**] and that “the condensing tube is formed of fused quartz to resist chemical attack” (Column 3, Lines 65-72) (**Claim 2**)

The arsenic chalcogenide cullet and sulfur mixture, which is loaded into the “hot section of the open system” is distilled and deposited in an adjacent “cold section of the open system” (**Claim 3**).

Upton teaches that the homogenization is conducted at approximately 550°C which reads upon the claimed homogenizing temperature of above 550°C as set forth in (**Claim 4, 15**).

The Upton process broadly discloses an open system which dynamically distills a mixture of a chalcogenide (e.g. sulfur) with an arsenic sulfide glass cullet. The reference further teaches that this starting arsenic sulfide glass cullet may be synthesized in a reaction between a stoichiometric mixture of the constituent elements

(As, S) of the cullet glass [**Claim 6**]. Additionally, Upton teaches that the synthesis of the arsenic sulfide cullet is *per se* "well-known to the glass making industry" (Column 5, line 69-70).

This position is supported by Applicants disclosure which states in part that " The initial process step of making arsenic monosulfide (As_4S_4) precursor is optional since the precursor can be purchased and its preparation can be thus avoided. When purchased, its purity will be low, which can be upgraded by known refining process" (page 8, lines 8-10). Since starting arsenic chalcogenide reagent is commercially available and refining techniques are known in the art, it follows, absent any compelling and substantially unexpected evidence to the contrary, that the claim limitations directed to the synthesis, purification, and homogenization of the arsenic monosulfide precursor are likewise old and well known in the art [**Claim 7-9, 16-17**].

The Upton reference is silent regarding three limitations as required in Applicants claimed invention;

1. Upton teaches the use of a "raw arsenic trisulphide glass" as precursor to the IR transmissive glass, but the reference is silent regarding the use of "arsenic monochalcogenide" or specifically arsenic monosulfide as a precursor in the reaction.
2. Upton does teaches reactive distillation in an "open distillation system" however the reference is silent regarding the claimed process wherein the distillation process is conducted as a "vacuum distillation".

3. Upton is silent regarding a specific rate of distillation for the sulfur and precursor as required by claims 12, 13, 14.

Churbanov teaches a method for making chalcogenide glass using arsenic monosulfide as a precursor reagent. Churbanov teaches that arsenic monosulfide is particularly advantageous in part because "this compound is more suitable for the ultrapurification from submicron particles because of the low viscosity of melts" (Pg 346, Paragraph 2-3).

The reference continues by stating "vacuum distillation in an open and closed system allows 3-10 times decrease of the content of impurities of highly volatile substances and of submicron particles [17]". Similarly, Churbanov teaches that the composition of the surrounding atmosphere "*used at the glass synthesis and glass treatment procedures*" (*emphasis added*) plays a central role in the purity and quality of the resulting vitreous arsenic chalcogenide. To this end, the reference explicitly states that "Arsenic and chalcogens have a tendency to oxidation at elevated temperatures ... for this reason the oxidation of chalcogens and arsenic in the open vacuum systems will be excluded at the vacuum better than 10^{-4} - 10^{-6} Pa" (see page 343).

Therefore with respect to point (1) above and in accordance with the Churbanov disclosure, it would have been obvious to one of ordinary skill in the art to substitute arsenic monosulfide for the arsenic trisulphide in the glass manufacture process as taught by Upton. The use of the monosulfide precursor would have been an obvious

substitution to one of ordinary skill in the art at the time of the invention seeking to increase the product glass purity by reducing the inclusion of submicron particles therein.

Regarding point (2) above, Churbanov teaches that open, vacuum distillation results an arsenic chalcogenide glass having a 3-10x reduction in volatile impurities and submicron impurities while simultaneously excluding oxidation of the glass. In view of the Churbanov disclosure, it follows that one of ordinary skill in the art would have been motivated to modify the Upton distillation process in order to operate under an open and dynamic vacuum distillation as taught by Churbanov. Such a modification would have been obvious for one seeking to reduce the content of volatile and submicron impurities in the resulting glass and/or to exclude deleterious oxidation thereof.

Regarding claim 5, Churbanov teaches that "Impurities having a high value of diffusion coefficient, especially hydrogen, enter the chalcogenide melt. It was established [5] that hydrogen from quartz glass, containing 100ppm of hydrogen, enters the melt of the chalcogenide glass starting from 650°C". (Pg342, paragraph 5, lines 1-4). On this point alone, it would have been obvious for one of ordinary skill in the art to seek to reduce the distillation temperature to at least below 650°C in order to minimize the inclusion of hydrogen impurities in the final glass product.

As further noted above, Churbanov advocates glass synthesis and treatment under reduced pressure in an open vacuum system. Although not particularly relied

upon for the instant rejection, the United States patent to Noblitt (US 3,042,501) teaches the vapor pressure and temperatures for various sulfides distilled under open, dynamic vacuum distillation conditions. Specifically with reference to the table presented on column 2 of the instant disclosure, Noblitt provides evidence that arsenic sulfide has a normal boiling point of 415°C, 430°C, and 470°C under pressures of 1 mmHg, 2 mmHg, and 10 mmHg, respectively. Noblitt further states that "this means that if the pressure is kept at 1 to 10 mms of mercury the sulphides will boil or sublime at these temperatures and the temperatures will not rise above those figures until the particular sulphide is entirely volatilized" (Column 2, lines 21-25).

Now, in view of the pressure ranges advocated by Churbanov for the open vacuum distillation conditions and the newly presented evidence set forth in the Noblitt reference, distillation temperatures of "below 550°C" are held as *prima facie* obvious over the prior art as indicated above. Specifically, Churbanov explicitly provides motivation to execute the distillation process at temperatures below 650°C as a means to minimize inclusion of hydrogen impurities in the glass melt. Further, at the reduced pressures taught for the open vacuum distillation in the Churbanov reference, the arsenic sulfide compounds would inherently display normal boiling points at least below the range of 415-470°C as evidenced in the Noblitt disclosure. It follows, in view of the foregoing and absent unexpected evidence to the contrary, that the claimed distillation temperatures represent a merely trivial and obvious extension over the collective prior art references.

Finally with respect to point (3) above, Upton is silent regarding a specific rate of distillation of the arsenic sulfur precursor and sulfur. In the disclosed chalcogenide glass manufacture process, Churbanov teaches that "the purification efficiency is very sensitive to the evaporation rate and the melt viscosity" (Pg 346, paragraph 4, lines 6-7). With the relationship between product purity and distillation rate in hand, one of ordinary skill in the art at the time of the invention would reasonably have been expected to optimize the distillation rate in the open vacuum system to any value which yields a desirable balance between production rate and product purity. Therefore absent any unexpected results to the contrary, the instant claim which sets forth a specific distillation rate of " $500-1500 \times 10^{-3} \text{ g/cm}^2\text{-sec}$ " is held to be *prima facie* obvious over the prior art as here presented [**Claims 12, 13, and 14**].

Claims 6- 9, 11-13, and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Upton and Churbanov as applied to claim 1 above, and further in view of Jerger (US 2,999,027).

While Upton generally discloses the manufacture of the chalcogenide precursor, neither Upton nor Churbanov explicitly address the prospect of distilling and homogenizing the arsenic sulfide compound as claimed in 8 and claim 11(b). Should Applicant contest the Examiners position that the synthesis, purification, and homogenization of the arsenic monosulfide precursor are old and well known to the skilled artisan, the following rejection is held to apply.

Jerger teaches a very closely related method of synthesizing an arsenic monochalcogenide glass as the methods disclosed in the Upton and Churbanov references.

Jerger specifically discloses that in order to achieve an optimum product "in the manufacture of glasses of the character indicated, it is necessary to use the purest raw materials possible". In order to achieve this optimal product, Jerger relates an initial step of "purification of the arsenic component of glasses of the character indicated by distilling arsenic disulfide (As_2S_2). This compound distills readily at the discrete boiling point of 565°C , representing the lowest boiling point of any arsenic sulfur combination in the liquid phase... My method further contemplates the subsequent addition of sulfur... in order to produce the appropriate glass composition." (Column 4, Lines 1-18).

The reference teaches that "from the point of view of refining the raw materials, arsenic presents the greatest difficulty since at normal pressures it passes directly from the solid to the gaseous state on heating." (Column 1, Lines 9-23).

With the Jerger disclosure in mind, it would have been obvious to one of ordinary skill in the art at the time of the invention to "distill the chalcogenide precursor". This would have been an obvious preliminary step to the Upton/ Churbanov process described above for one of ordinary skill seeking to obtain the highest quality chalcogenide glass by insuring "the purest raw material possible".

Response to Arguments

Applicant's arguments filed December 13, 2007 have been fully considered but they are not persuasive.

Applicant first presents arguments directed against the Upton and Churbanov references alleging in part that "none of the references discloses the limitation in claim 1 of distilling the arsenic monochalcogenide and at least one chalcogenide under vacuum in an open distillation system". To this end, Applicant alleges that the Upton references show distillation in a closed system and that Churbanov does not teach simultaneous vacuum distillation of the arsenic monosulfide and sulfur.

The Examiner strongly disagrees with Applicants Allegations.

First regarding Applicants arguments against Upton, Applicant is directed to Figure 8 of Upton '378 elements (59) and (74). The instant reference further instructs that "a non-oxidizing atmosphere is introduced into the interior of the condensing tube 66 by means of a hose 74...impurities are allowed to escape through the opening 64" (Column 6, lines 46-52). It should be evident from the foregoing that Upton in fact does instruct the use of an open distillation system. Applicants arguments asserting otherwise are held to be unpersuasive.

Next, Applicant broadly asserts that Churbanov does not teach distillation of both reactants together. In support of this position, Applicant broadly points to page 346, last paragraph of the Churbanov reference, however Applicant provides no specific rebuttal of the Examiners interpretation of the identical passage as presented in the prior Office Action dated January 18, 2007. For at least this reason, Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the

claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Response to Amendment

The affidavit filed on December 13, 2007 under 37 CFR 1.131 has been considered but is ineffective to overcome the Churbanov reference.

Although the evidence presented by Applicant appears to display a spectroscopic and/or structural difference between a glass distilled at 750oC in a closed vacuum system and a glass distilled at 450oC in an open system, Applicant has presented only a single spectrograph in support of this position. Applicant has provided no evidence regarding the starting glass compositions, the explicit experimental protocols utilized, or any evidence to support the statistical significance of the reported results.

Additionally, it is the Examiners position that Churbanov explicitly provides motivation to operate the distillation process under an open and dynamic vacuum condition (see detailed rejection of claims above). It follows that Applicants experimental results detailing a distillation "at 750oC in a closed vacuum" are immaterial to the question at hand, namely whether one would be motivated to modify the Upton distillation process to utilize an open vacuum distillation technique as set forth by Churbanov.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Lazorcik whose telephone number is (571) 272-2217. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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JLL


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PRIMARY EXAMINER